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THE ECONOMICAL WINTER FEEDING OF BEEF COWS IN THE CORN BELT.

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THE NEED FOR MORE ECONOMICAL FEEDING OF BREEDING COWS.

A great many farmers in the corn-belt States keep cows of the beef or the dual purpose type for the production of feeder calves. On the smaller farms, having twenty cows or less, the custom is to milk the cows and to sell milk products, usually cream. The calves from some of these farms are sold to other farmers, who make a practice of purchasing such animals and of feeding them out in carload lots. Some farmers, however, make a practice of finishing their own calves and enough more calves bought from their neighbors to enable them to fill out a carload. On the larger farms, twenty cows or more usually are kept only for the production of feeder calves, which usually are fed out on the same farm as baby beef, or as two-year-olds, or three-year-olds. On some of the farms of the above-described types calves are produced at a substantial profit, and on others, calves are produced at a heavy loss.

Although there are a number of factors that govern the profitableness of the calf-growing enterprise, an investigation carried on by the United States Department of Agriculture in the corn-belt States

during the last three years show that losses on calves usually are due to excessive maintenance costs of the breeding cows.[1]

Much study has been devoted to selecting for dairy cows, and also for fattening cattle, rations that will give the best and most economical results. There seems, however, to be but little information on the best rations for beef-breeding cows, although the data at hand clearly indicate that these animals must be wintered at as low a cost as is consistent with their welfare. When a cow is kept only for the production of calves, she should be fed a ration that will enable her to produce and raise a good strong calf and still keep in good bodily condition. To feed in excess of this amount merely for the sake of having a fine appearing cow, as is frequently done, is a waste of feed. This waste increases the maintenance cost, often to the point of wiping out profits, for when the business is conducted on as close a margin as at present it is impossible to raise calves at a profit unless the strictest economy is practiced in feeding the cows.

BREEDING HERDS MUST GET MOST OF THEIR LIVING FROM FARM BY-PRODUCTS.

The information at hand shows that where cows are kept exclusively for the production of feeder animals there must be a sufficient area of pasture, most economically utilized, to support the animals for at least six months of the year. Not only must they get fully one-half of their living from cheap grazing but they must be so handled during the remainder of the year that the greater portion of their winter feed is made up of those unsalable rough feeds, such as stalks, stover, and straw, which are abundant on corn-belt farms. The data obtained also show that on corn-belt farms the size of the herds usually should be limited to the number that can be supported on such cheap feeds. In other words, with the prices prevailing during recent years, the breeding herds must be made to utilize the farm by-products and convert them into beef and manure, while the more valuable products are sold or are fed to fattening animals.

Every year there are large quantities of corn stover which are not utilized to their fullest extent. Every year also a vast quantity of straw is wasted by letting cattle run to the stack and trample under foot more straw than they eat. An excellent illustration of this is shown in figure 1, where straw piles for three successive years are shown. Most of the straw on this farm is allowed to rot in piles and is not even hauled out as manure. In some parts of the country large quantities of straw are destroyed by burning. Much of the

[1] This investigation is being conducted cooperatively by the Office of Farm Management and the Bureau of Animal Industry. The results of the first two years' work have been published in Report 111, Office of the Secretary, "Methods and Cost of Growing Beef Cattle in the Corn Belt States."

straw so wasted might be used to replace some of the more valuable feeds that beef cows receive. It is true that in many parts of the country in times past it has been better farm economy to allow these products to be destroyed rather than to try to use them. However, under present conditions, not only is it necessary that cattle should be handled in such a manner as to use as much of these by-products as possible, but also, if possible, the farm business should be arranged so that enough stock is kept to consume fully these cheap roughages.

These cheaper rough feeds can be utilized more fully than is customary and much less grain and hay need be fed to breeding herds. This is demonstrated by the results of the investigation upon which this bulletin is based. In this investigation approximately 1,000 farms were visited, and detailed information was obtained on the cost of maintaining the breeding herds on these farms as well as on

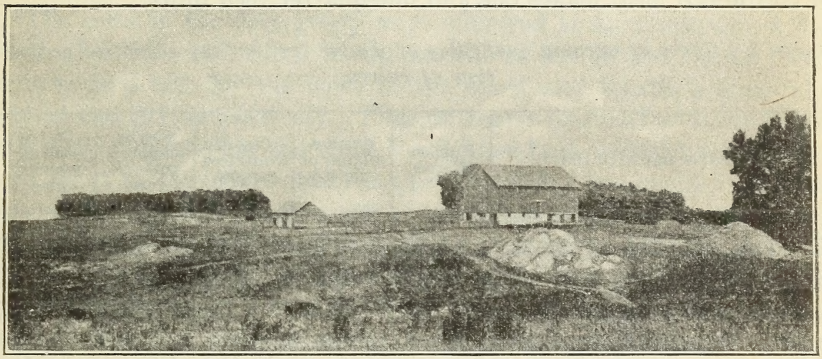

FIG. 1.—Here the straw is fed in the winter feed lot, where the cattle run to the stack and trample under foot the straw they do not eat. In this particular case the straw is not even saved for manure.

the cost of producing the feeder cattle. In addition to the cost accounting figures, a study also was made of the methods used in caring for the cattle. This study is based on records from 478 of these farms, upon which the breeding herds were kept solely for the production of calves to be fed out as baby beef, two-year-olds, or three-year-olds. On these farms the average cost of a calf at weaning time, figuring all expenses and deducting all credits, was $37. There was, however, a very wide range in the cost of these calves, depending somewhat on the locality in which the calves were raised and very largely on the methods followed in producing them. On some farms this cost was as low as $25 per calf, while on others it exceeded $50.

On the farms visited there was a very wide range both in the quantity and the kind of rations fed. Some farmers were feeding a ration that was hardly adequate, while others were giving their

cows more feed than they could possibly eat. Some were carrying their cows through the winter in fairly good condition at a very low cost, while others were using large quantities of expensive hay and grain, with a resultant heavy winter feed bill. Many of the latter could have greatly reduced the cost of their rations by a judicious substitution of cheaper feeds for some of the more expensive ones.

AVOID FEEDING EXCESSIVE RATIONS.

That the various rations, which differed widely in kinds of feeds used as well as in quantity given, might be made comparable, all the feeds for these 478 farms were reduced to the "feed unit" basis, in which 1 pound of corn is equivalent to one feed unit.[1] In this system 1 pound of alfalfa equals one-half feed unit, and 1 pound of cottonseed meal makes one and one-quarter feed units.

TABLE I.—*Effect of varying quantities of winter feed on the economic production of calves.*

Feed units per animal (165 days).	Number of farms.	Average number of units fed.	Cost of winter feed per cow.	Cost of keeping a cow one year.	Cost of calf at weaning time.
Under 1,750	131	1,550	$10.70	$29.00	$30.00
1,750 to 2,249	142	2,000	13.50	33.50	35.00
2,250 to 2,749	83	2,350	18.50	37.20	41.00
2,750 and over	122	3,200	21.00	39.60	43.00
All farms	478	2,280	15.50	34.50	37.00

On the basis of the average quantity of feed given to a cow, the records from these 478 farms were divided into four groups. That they might be comparable they also were standardized to a winter feeding period of 165 days, this being the average for all the farms. In the first group, 131 farms (see Table I), the cows were given an average of 1,550 feed units per head during the winter feeding period. The cows in the second group, 142 farms, received an average of 2,000 feed units, while those in the third group were fed an average of 2,350 feed units. In the fourth group, 122 farms, an average of 3,200 feed units per head was fed during the winter, this being double the amount fed to the cows in the first group. On 30 of the farms in the last group the cows were fed more than 4,300 feed units per head, or nearly three times as much as those in the first group.

This great variation in the quantity of feed given in the different groups was not due to any especial difference in the kinds of feeds, as the average ration in the four groups contained the same propor-

[1] See "Feeds and Feeding," 16th edition, Henry and Morrison, pp. 126–128.

tion each of cheap roughages, hay, fodder, silage, and grain. This being the case it is evident that if the farms in the first two groups, which comprise approximately two-thirds of all the farms, were feeding their cows enough, the rest were feeding their cows a great deal more than they needed. Much of this excess feed undoubtedly was trampled under foot and wasted.

The records in the first two groups were analyzed to determine whether the cows in these groups were receiving a ration that was adequate for the maintenance of a cow in calf. The analyses showed that although the rations on a few of the farms in the first group were hardly adequate, nevertheless the majority of the cows were getting enough feed to carry them through the winter in fair condition. It also showed that the cows in the second group were receiving ample feed; in some cases even more than was absolutely necessary.

The cows in the first group were wintered at an average cost for feed of $10.70 and those in the second at $13.50 per head.[1] The winter feed bill for the cows in the third and fourth groups was $18.50 and $21, respectively. Thus on nearly one-half of these farms the cost of wintering the cows could have been reduced materially, and many of the calves that were produced at a loss could have been grown at a profit. In fact, 800 of the calves produced on the farms in the first group were sold at weaning time for an average profit of $4.60 per head, while 700 from farms of the last group sold at the same time showed a loss of $8.90 per head. As the number of calves sold at weaning time is hardly large enough to constitute a fair index, the average value of the remaining calves, inventoried when turned on pasture at an average age of 13 months, may be cited. The inventoried value of the calves in all four groups was approximately $38 per head. The 2,200 calves inventoried in the first group showed a loss of but $5 at that time, while the 1,600 inventoried in the last group showed an average loss of nearly $20 a head.[2]

An effort was made to determine whether the varying rations had any effect on the number of calves produced and on their quality. This study showed that the percentage of calves was approximately the same in each of the four groups.

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[1] In determining the cost of the winter feed for the cow, the various feeds were, so far as possible, priced at their sale value on the farm—that is, the market value less cost of hauling. The price for fodder was based on the value of the corn it contained plus a charge for the cutting and the value of the stalks or stover. Silage was figured in much the same manner.

[2] The calves were inventoried when they were turned on pasture, May 1. As they still had to maintain all expenses of the breeding herd as well as an expensive winter feed bill, they were inventoried at relatively the most expensive point in their history. Had the calves been carried on pasture until the following November and then inventoried, those in the first group would have given a substantial profit, while the loss on the others would have been much less.

AVOID COSTLY RATIONS.

Not only were some of the farmers giving their cows too much feed, but many of the feeds used were altogether too high priced. The farms were again divided into four groups, the grouping based on the average daily feed cost per cow. The average daily feed cost per cow in each of these groups was as follows: 5.8 cents on 98 farms, 8.4 cents on 162 farms, 10.3 cents on 131 farms, and 13.7 cents on 87 farms. The average winter feed cost for the cows in the first group was $10. In spite of the fact that the cows in the fourth group were carried for a 10-day shorter winter feeding period, and were given nearly one-fifth less feed than those of the first group, they cost $12 a head more to winter, or $22. This great difference in the cost of wintering the cows in these two groups was due largely to the kinds of feed used. The farmers in the first group were carrying their cows through the winter on a ration 62 per cent of which was made up of cheap roughages, such as stalks, stover (cut corn from which the ears have been removed), oat and wheat straw, and some winter pasture. The remainder of the ration consisted of 30 per cent hay, 4 per cent fodder (cut corn containing the ears), and 2 per cent each of silage and grain. The cows in the fourth group, which were fed at a cost of 13.7 cents a head per day, were, on the other hand, receiving a ration that contained only 24 per cent cheap roughage as against 40 per cent hay, 12 per cent fodder, 14 per cent silage, and 10 per cent grain.

USE MORE CHEAP ROUGHAGE.

The figures cited above indicate that there is an opportunity for many of the corn-belt farmers to reduce considerably their winter feed bill by the greater utilization of the farm by-products, such as straw and corn stover. A study, therefore, was made to determine the effect of feeding varying proportions of these cheap roughages, the farms again being divided into groups. There were 14 farms (see Table II) on which no cheap roughages were fed. The average ration on these farms was composed of 54 per cent hay, 25 per cent fodder, 10 per cent silage, and 11 per cent grain. The daily cost of this ration was 11 cents. In the second group, 229 farms, the average quantity of cheap roughages fed was 24 per cent, these feeds replacing fodder and silage to a limited extent. Although the figures show a smaller percentage of hay and grain, as a matter of fact the farms in this group fed on the average one-tenth of a ton more hay and a little more grain than those of the first group, feeding altogether 2,250 feed units as against 1,950 for those in the first group. Because of the larger amount of feed given, this ration cost approxi-

mately the same as that for the first group, or 10.7 cents daily. On the 207 farms of the third group the cheap roughages replaced to a great extent the more expensive feeds. Although these farmers were the heaviest feeders, this ration cost per cow 2.5 cents a day less than that for the second group, and 2.8 cents less than that for the first group. This means a saving of $4 or more in the winter feed bill for each cow.

TABLE II.—*Relative percentage of different feeds where varying quantities of cheap roughage are fed and effect of these rations on cost of keeping a cow and of producing a calf.*

Relative quantity of cheap roughage.	Number of farms.	Total feed units.	Cheap roughage.	Hay.	Fodder and silage.	Grain.	Daily feed cost per cow.	Winter feed cost per cow.	Cost of calf at weaning time.
			Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Cents.*		
No cheap roughage	14	1,950	0	54	35	11	11.0	$18.00	$39.00
1 to 39 per cent	229	2,250	24	47	23	6	10.7	17.70	39.00
40 to 79 per cent	207	2,350	58	28	10	4	8.2	13.80	34.00
80 per cent and over	28	2,150	89	6	2	3	5.5	9.00	30.00

[a] By "corn fodder" is meant the entire plant cut and shocked. In many localities it is known as "shock corn."

The calf crop was practically the same in all three groups, 87.1 in the first and 85.5 each in the two others. The calves in the third group cost $34 at weaning time, as against approximately $39 for those in the first and the second group. Of the calves sold at this time, 1,150 in the third group show a profit of about 75 cents each; while 1,050 in the two other groups show a loss of approximately $4 per head. The calves in the first two groups were produced at a loss largely because their dams were not fed as economically as were those of the third group.

In the fourth group—28 farms—over 80 per cent of the ration was made up of cheap roughage. The cows in this group were carried through the winter at an average cost of $9 per head, or for 5.5 cents a day. This is only one-half the cost of wintering the cows in the first two groups, and nearly $5 less than the cost for the third group. The calf crop in this group averaged only 78.3 per cent. However, a study of the records indicates that this poor calf crop was not due necessarily to the ration. Fifteen of the farms were in Iowa and Missouri, and on these the average calf crop was 91.7 per cent. The remaining 13 farms were in Kansas and Nebraska, where the percentage of calves produced is normally much lower, partly because the cows are not as well cared for and partly because there is more trouble with contagious abortion. The average calf crop for these 13 farms was only 67 per cent, which accounts for the low percentage for the group as a whole. In spite of this low percentage, the calves in this group were produced at an average cost of only $30 per head. Of

these calves sold at weaning time there were only 109, which is hardly enough to be an accurate measure. They, however, made an average profit above all expenses of $2.25 a head.

Approximately two-thirds of the calves in each group were carried through the winter and were inventoried when turned on pasture during the following May. All showed a loss at this time, but the loss was much less for the calves whose dams received the ration of more than 80 per cent roughage. These calves showed a loss of $4.25 per head, as against $15 for those whose dams received less than 40 per cent roughage. The calves in the third group, in which the cows received 40 to 80 per cent roughage, showed a loss of approximately $11.25.

USE AVAILABLE FEEDS MOST ECONOMICALLY.

Beyond the fact that ordinarily the major portion of the ration for these cows should be made up of the cheap roughages or farm by-products, such as cornstalks or straw, there is no fixed rule that should govern the quantity or the kind of feeds used except that the ration should be adequate and economical. Whether the remainder of the ration shall be composed mostly of hay, fodder, silage, or grain will depend ordinarily on local and seasonal conditions.

In years when there is a serious shortage of corn, farmers will find it necessary greatly to reduce the quantity of the corn that ordinarily is fed as grain or in fodder or silage. That this can be done under many circumstances is evident from a further study of the records. They show that a ration which does not contain corn either as grain or in fodder or silage can be fed without any detriment whatever to the cows or their offspring. There were 149 farms feeding such rations, the majority of them in Kansas and Nebraska, and they produced as good calves as the farms feeding corn. The winter feed bill on these farms was $13.10 per cow, as against an average of $16.60 for those using grain, fodder, or silage, showing a saving of $3.50 per head due to elimination of corn.

The use of such a grainless ration, which on these farms consisted solely of hay and cheap roughage, is, of course, not always possible or practicable. If this type of ration is to be economical, there must be an abundance of cheap hay to combine with the rough feeds; or, if the bulk of the ration consists of cheap roughage, which, unless there is some winter pasture, is largely composed of carbohydrates, there should be a sufficient amount of leguminous hay, such as alfalfa or clover, to supply the protein needs of the animal. In localities where there is a shortage of hay but where large quantities of cheap roughage, such as corn stover, straw, or damaged hay, is available, this cheap roughage often can be made to serve as the greater part of the

ration by supplementing it with a small amount of some concentrate high in protein, such as cottonseed meal. The farmers in that portion of the corn belt lying west of the Missouri River, where alfalfa is grown abundantly, nearly always can plan an adequate ration without corn.

THE FEEDING OF GRAIN.

The fact that the 149 farms using the cheaper ration were not feeding corn does not imply that it should never be used, for there are farms where it is necessary to feed a moderate amount of grain. This is particularly true of cattlemen who are conducting a pure-bred business and who advertise their stock by exhibiting at the various live-stock shows. The results of this study simply indicate that care should be taken that no unnecessary quantities of corn are fed.

There were 154 farms (not quite one-third of those studied) on which corn was fed to the breeding herd for at least part of the winter. The average winter feed bill for these farms was $17.10 per head, as against $14.80 for the cows receiving no grain. There were 58 of these farms where less than 10 per cent of the ration was composed of grain and where the cows received an average of 2 bushels of corn and 15 pounds of cottonseed meal per head during the winter. As 42 per cent of this winter ration consisted of cheap roughage and as the amount of feed used was not excessive, the cows were carried through the winter at an average cost for feed of $14.60, or 9 cents a day. In the herds where grain constituted more than 10 per cent of the ration, the cows received an average of from 6 to 18 bushels of corn, much of which was unnecessary. The average cost of feed for wintering these cows ranged from $17.50 to more than $20 a head.

THE USE OF CORN FODDER.

Probably one of the largest wastes of corn occurs in the feeding of unhusked corn fodder, which is extensively fed in sections where corn is the leading crop and where hay is scarce. When corn is relatively cheap as compared with other crops, or when the corn is of poor quality, the feeding of unhusked fodder is, under many circumstances, an excellent practice; but when corn is high-priced, it is usually better to husk out most of the grain and feed the cut stover.

On 148 farms that reported feeding unhusked-corn fodder to their breeding herds, the average winter-feed cost for the cows was $17.10, this being $1.60 above the average winter-feed bill for all farms and exactly the same as for those feeding grain. As would be expected, but little grain or silage was fed on these farms. The fodder also was used to replace hay. It was noticeable that the

farmers feeding unhusked-corn fodder were using much heavier rations (averaging 2,400 feed units) than many of the others. This would seem to indicate that many of the farmers using this ration are merely following a practice that was established years ago when corn was much lower in price.

THE USE OF SILAGE.

In many sections of the corn belt corn fodder is being replaced gradually by silage in the ration for beef animals. Where there are enough animals to justify the building of a silo the feeding of silage is usually the more economical practice of the two, as a much larger proportion of the stover can be utilized as silage than otherwise. Not only is the corn plant more fully utilized, but cattle usually do better on silage than on a dry winter ration.

Silage, because of the grain that it contains and because of the expense of putting it up, is a relatively expensive feed; consequently in localities where large amounts of cheap, rough feeds are available the silo may not always prove economical. However, when such roughage is scarce and high priced the feeding of silage usually will pay. This would be especially true if, instead of cutting their highest-yielding corn, the farmers habitually would select that part of the crop having the least grain. The silo is of especial value in helping to make the most of the corn crop in years when the corn is badly damaged by drought or when because of frosts it does not get a chance to mature.

In years when hay and grain are both high, the putting of husked stover into the silo should prove profitable. Although this practice has not been extensively followed, the results that have been reported seem satisfactory.

The results of this investigation would indicate that silage is an excellent feed for breeding animals, but that from the standpoint of economy it ordinarily should be fed only in moderate amounts and that it should not replace too much of the cheap roughage. One hundred of the farms (or nearly one-fifth of those under consideration) were feeding silage, and their average winter-feed bill was $16 per head. On 29 of these farms approximately 12 per cent of the ration was silage, an average of three-fourths of a ton being fed to the cow. As 41 per cent of the feed was made up of cheap roughage, the silage displaced only fodder and the more expensive hay and grains. The average cost of wintering the cows on these farms was $14. The average quantity of silage fed on the next 50 farms was 1.8 tons, nearly one-third of the ration being made up of this feed. Although the cows on these farms received 100 feed

units less feed, their winter-feed bill was $16.53. In the next group, 21 farms, silage constituted one-half of the ration, the cows receiving an average of 2.75 tons each. As only one-fourth of this ration was composed of the cheaper roughage, the average feed bill for these cows was $17 although they received 400 feed units less than did the cows in the first group. It is evident that on the farms in this third group silage was replacing too largely the cheaper farm by-products.

STUDY OF RATIONS ON SELECTED FARMS.

It is evident from the foregoing that in the corn-belt States many of the farmers who are producing their own feeder cattle need to give more consideration to the rations that are being fed. If farmers will take more pains to find out the nutritive requirements of their stock and will then plan rations that shall be as economical as possible and at the same time adequate, many of them can lower greatly the cost of their winter feed bills.

To show the possibilities of cheapening some of these rations, five farms have been selected, that their winter feeding system may be studied in detail. The farms chosen are representative of feeding practices found in vogue in different places throughout the region covered by the survey. On four of these farms the cows were receiving more feed than they needed, and doubtless on at least three of them the feed was not utilized fully. However, care has been taken not to select any farms of the extreme type. There is only one that was feeding in excees of 3,000 feed units per head during the winter season.

In the discussion of the rations used on these farms, no attempt is made to indicate a ration that shall be fully balanced or that shall be even the most economical. Nor has any study been made to determine whether the rations contain enough minerals for the animals, though generally in the rations outlined there will be a sufficient quantity of these. The suggested changes have been confined to showing that many farm rations can be modified easily in such a manner as to save expense.

FARM NO. 1.

The first of these five farms is in east-central Iowa. It contains 240 acres, of which, for the year studied, 80 acres were in corn, 35 in oats, 50 in clover, and 60 in pasture. The breeding herd consisted of a grade bull and 22 grade cows from which 20 calves were obtained. The cows were given excessive amounts of high-priced feed for both of the years during which records were procured.

They were turned on stalks on November 15. Winter feeding began a few days later and lasted until May 1, when the cows were again turned on pasture. During the 165-day interval each cow received the following:

Stalks	1⅛ acres, at $1 an acre.
Fodder	⅔ acre, at $35 an acre.
Mixed hay	¾ ton, at $10 a ton.
Corn	2 bushels, at $0.65 a bushel.

As the average yield of corn on this farm was 50 bushels to the acre, and as the best corn was cut for fodder, the cows, considering the corn in the fodder and the additional grain fed, received a total of 22 bushels per head. This is almost a fattening ration. If the corn had been husked from the fodder and only the stover fed, there would have been sufficient roughage for the cows. Estimating that three-fourths of a ton of stover was eaten per acre of stalks and that the stover from the fodder fed would go 2 tons to the acre, and allowing the cows 3 bushels of corn each during the winter instead of 22, they would receive the following daily ration:

Stover	20.6 pounds.
Mixed hay	9.0 pounds.
Corn	1.0 pound.

This ration would be sufficient for their needs.

By merely eliminating the excessive amount of corn (19 bushels) from the ration a saving of $11.40 could have been made and the feed bill reduced very nearly one-half, or from $24 to $12.60 per cow. The calves, which actually cost $43 at weaning time, would then have cost only $30.

FARM NO. 2.

The second farm is in the west-central part of Iowa. It contains 225 acres, valued at $175 an acre. There were 80 acres in pasture, 65 in corn (10 of which were for silage), 30 in oats, and 30 in timothy hay. The breeding herd consisted of a good bull and 20 high-grade cows, from which 20 calves were raised. The cows were turned on stalk fields on November 15 and allowed the run of the fields during the winter. Beginning December 1 they were fed silage, timothy hay, and oat straw. The ration per cow as reported was as follows:

Stalks	1.8 acres, at $0.75 an acre.
Silage	3.5 tons, at $4 a ton.
Timothy hay	1 ton, at $12 a ton.
Oat straw	0.75 ton, at $2 a ton.

This ration contained much more feed than the cows could utilize and probably most of the straw was wasted. It could have been

cheapened greatly by leaving out the timothy hay, which, because of a scarcity of hay in that particular year, was valued at $12 a ton. In addition, 1 ton of silage could have been saved by properly feeding the oat straw instead of allowing the cattle to trample the greater part under foot. Estimating that the stalk fields contained three-fourths of a ton of edible stover per acre, with these changes the daily ration for the cows would have been as follows:

Stover	16 pounds.
Silage	30 pounds.
Oat straw	9 pounds.

This ration contains sufficient dry matter and digestible nutrients to carry the cows through the winter, but the total amount of protein is below the percentage called for by feeding standards. It would, of course, be much better if there were some clover or alfalfa on this farm, so that a moderate amount could replace some of the silage. However, this is the best ration that can be devised from the feeds available. If this farmer would feed from one-half to 1 pound daily of either linseed meal or cottonseed meal, the ration would be greatly improved. Assuming that he purchased 100 pounds of cottonseed meal per cow, costing $2.25, the ration would be adequate and there would still be a saving of $13.75 on the winter feed bill, which would have been reduced from $28.75 to $15. Such a saving in the cost of wintering the cows would mean that the calves, which actually cost $51.50 per head at weaning time, would have been produced for $38, or for only $1 more than the average for all calves.

FARM NO. 3.

The third farm is in a region in southwestern Iowa that for years has had a reputation for prime beef. Many prize-winning carload lots of fat cattle have come from this locality. Because of this reputation there is a certain rivalry among farmers here in the matter of the appearance of their herds, with the result that many of the farmers are inclined to feed more heavily than is necessary. This particular farmer was not feeding nearly as heavily as were some of his neighbors, but it would have been possible for him to feed less and still maintain his herd in good condition and thus effect a saving on the cost of wintering his cows.

This farm comprises 200 acres, of which 50 were in pasture, 80 in corn, 20 in oats, and 30 in timothy and clover. The herd consisted of 22 high-grade cows and a pure-bred bull. The calf crop was kept down by contagious abortion and only 14 calves were saved. The cows were turned on stalks the middle of November. Winter feeding began the middle of January and lasted until they were turned on

pasture May 15. From November 15 to May 15 each cow received the following:

Stalks	2 acres, at $0.75 an acre.
Clover hay	1½ tons, at $8.00 a ton.
Corn	3⅓ bushels, at $0.60 a bushel.
Oat straw	1 ton, at $1 a ton.

The winter feed bill amounted to $16.40. This ration is more moderate and better balanced than that fed on Farms No. 1 and No. 2. However, the amount of clover hay could have been reduced three-fourths of a ton, or to one-half the amount fed, and the corn to at least 1 bushel, if the oat straw had been properly fed and not wasted. The cows then would have received a daily ration of corn 1 pound, clover hay 12½ pounds, and oat straw 16¾ pounds, which should have been sufficient for their needs. In fact, the corn probably could have been safely reduced to 1 bushel and used only during the coldest weather.

This saving of three-fourths of a ton of hay and 1 bushel of corn would have amounted to $6.60 per head and reduced the winter feed bill to $9.70. Because of the very poor calf crop, each calf on this farm had to be charged with the expense of maintaining 1½ cows, besides their proportionate share of the bull charge, and thus their cost at weaning time was $52.60 per head. This cost would have been reduced to $42.25 if the saving above suggested had been effected.

FARM NO. 4.

In eastern Kansas there is a region, covering several counties, that is very much broken and where a limestone formation crops out in many places. These hills, because of the numerous limestone outcrops, are devoted to pasture. Interspersed between the hills are valleys of rich bottom land, where much alfalfa is grown. A large part of this alfalfa is fed to the cattle that run on these pastures during the summer months. The cows in this region are wintered largely on alfalfa, and as this hay usually is very cheap, extravagant quantities sometimes are fed. To contrast the practices followed in this region with those just described for Iowa, a 335-acre farm may be cited. This farm had 130 acres in alfalfa, 20 acres in corn, 120 acres in hill pasture, and 60 acres in waste land and timber. The breeding herd consisted of a pure-bred bull and 30 high-grade cows, which dropped 27 calves. The cows were taken off pasture November 1 and fed until May 1, receiving a ration of one-half acre of stover and 3 tons of alfalfa per head. The stover was valued at $2 an acre and the alfalfa at $5 a ton, the total winter feed bill being $16.

More hay was fed than the cows really needed. Indeed, if the hay had been decreased 1 ton, the ration still would have been adequate, providing sufficient digestible nutrients and more than double the

amount of protein needed. As protein feeds are usually expensive, it is customary to devise rations containing just the necessary amount of this nutrient. However, alfalfa is the cheapest feed available in this case.

Reducing the feed by 1 ton of alfalfa would have cut the winter feed bill $5 per cow. The calves, figuring all expenses, cost $39 each. Considering that each calf bore the maintenance charges of 1.1 cows, as well as a bull charge, a saving of $5 per cow would have reduced their cost at weaning time to $33.50. As they were sold September 15 for $35 a head, this saving would have meant a profit of $1.50 each above all expenses, as against an actual loss of $4.

FARM NO. 5.

The ration used on the fifth farm was very satisfactory. It is shown in order to illustrate how a farmer can grow emergency forage crops to take the place of hay when the hay crop is a failure. This farm (240 acres) is in northeastern Kansas. Seventy acres were in corn, 25 in oats, 25 in wheat, and 100 in pasture. Because of the unusual rainy weather prevailing in that section the oats and wheat for the year in which the record was taken were practically destroyed and the straw was absolutely worthless for feeding. To provide for a lack of hay 15 acres of millet and 4 of sorghum were grown.

The herd consisted of a bull and 15 grade cows, from which 15 calves were obtained. The cows were turned on stalks November 1 and allowed to run there until spring. They received approximately 3 acres of stalks, 1 ton of millet hay, and one-third of a ton of sorghum fodder each. Valuing the millet at $4.50 a ton and the sorghum at $4 a ton, the winter feed cost per cow was $8.20. The cows were carried through the entire year for a net cost of $25.85. The calves cost at weaning time, or October 1, $27.30 per head and sold on that date for $34.50, at a profit of $7.20.

CONCLUSIONS.

The results obtained from this study show that a large percentage of farmers maintaining herds for the production of beef animals do not study their rations carefully in order to determine whether they are properly balanced and at the same time as economical as possible. Many of the farmers visited evidently were trying either to get their cows through the winter as cheaply as possible or simply feeding them enough to carry them through the winter in first-class condition. In contrast to such practices are the methods of dairymen who produce market milk; they have learned by experience that with the prices now prevailing if they are to continue in

the business, they must plan their rations so that they will get the largest possible returns at the lowest possible cost. The corn-belt steer feeders have also learned that with the close margin with which feeding is conducted they also must plan economical rations if they are to succeed. With steer feeding as well as with dairying, much experimental work has been done along this line.

Although it is not necessary to plan the rations for breeding cows as carefully as for dairy animals, or for fattening steers, nevertheless the data obtained show the need of more care on the part of a large number of these farmers in the planning of their winter rations. It is therefore strongly recommended that the farmers who raise their own feeder cattle take more pains to find out the needs of their animals and feed them accordingly. For the benefit of the farmers who are not familiar with methods of working out rations, it is suggested that they write to either their own State experiment station or the United States Department of Agriculture asking for help in planning these rations. In this letter they should state the kinds and qualities of different feeds available for use and the number of stock to be carried through the winter. They also should give a brief outline of how they would like to handle their stock.

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